

CLAIMS

1. A silicon nitride abrasion resistant member formed of silicon nitride sintered body containing 2% to 4% by mass of a rare earth element in terms of oxide thereof as a sintering aid, 2% to 6% by mass of an Al component in terms of oxide thereof, and
5 2% to 7% by mass of silicon carbide, wherein said silicon nitride sintered body has a porosity of 1% or less, a three-point bending strength of 800 to 1000 MPa, and a fracture toughness of 5.7 to 6.5 MPa·m^{1/2}.
2. The silicon nitride abrasion resistant member according to Claim 1, wherein said
10 silicon nitride sintered body contains 3% by mass or less of at least one element selected from the group consisting of Ti, Zr, Hf, W, Mo, Ta, Nb, and Cr in terms of oxide thereof.
3. The silicon nitride abrasion resistant member according to Claim 1, wherein said
15 silicon nitride sintered body contains 10 to 3000 ppm of Fe.
4. The silicon nitride abrasion resistant member according to Claim 1, wherein said sintered silicon nitride sintered body contains 10 to 1000 ppm of Ca.
- 20 5. The abrasion resistant member according to Claim 1, wherein when three SUJ2 rolling steel balls having a diameter of 9.35 mm placed on a track having a diameter of 40 mm disposed on the top surface of a plate abrasion resistant member formed of the sintered silicon nitride are rotated at 1200 rpm under a pressing load of 39.2 MPa, the rolling life, which is defined by the number of rotations that have been occurred by
25 the time the silicon nitride abrasion resistant member is exfoliated, is at least 1×10^7 .

6. The abrasion resistant member according to Claim 1, wherein when the silicon nitride sintered body has a crushing strength of 150 to 200 MPa and a fracture toughness of 5.7 to 6.5 MPa·m^{1/2} and when three rolling balls having a diameter of 9.35 mm prepared from an abrasion resistant member formed of the silicon nitride sintered body are placed on a track having a diameter of 40 mm disposed on the top surface of an SUJ2 steel plate and are rotated at 1200 rpm under a maximum contact stress of 5.9 GPa, the rolling fatigue life, which is defined by the elapsed time until the sintered silicon nitride rolling balls are exfoliated, is at least 400 hours.

7. A method for manufacturing a silicon nitride abrasion resistant member, comprising the steps of: preparing a raw material mixture by adding 2% to 4% by mass of a rare earth element in terms of oxide thereof, 2% to 4% by mass of Al₂O₃, and 2% to 7% by mass of silicon carbide to silicon nitride powder; molding the raw material mixture into a molded compact; and sintering the molded compact in a non-oxidizing atmosphere, wherein said silicon nitride powder is synthesized by metal nitriding method, contains 1.5% by mass or less of oxygen and at least 80% by mass of α-phase type silicon nitride, and has an average particle diameter of 1 μm or less.

8. The method for manufacturing a silicon nitride abrasion resistant member according to Claim 7, wherein 3% by mass or less of at least one element selected from the group consisting of Ti, Hf, Zr, W, Mo, Ta, Nb and Cr in terms of oxide thereof is added to said silicon nitride powder.

9. The method for manufacturing a silicon nitride abrasion resistant member according to Claim 7, wherein 2% to 4% by mass of Al₂O₃ and 1% to 3% by mass of AlN are added to said silicon nitride powder, and the total content of the aluminum

components in the raw material mixture is 6% by mass or less in terms of oxide thereof.

10. The method for manufacturing a silicon nitride abrasion resistant member
5 according to Claim 7, wherein the silicon nitride sintered body is subjected to HIP
treatment at a pressure of 30 MPa or more in a non-oxidizing atmosphere after the
sintering step.